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JARRETT, RYAN A	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/759,108	SCHWARM, ALEXANDER T.	
	Examiner	Art Unit	
	Ryan A. Jarrett	2125	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16 and 18-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16 and 18-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 October 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claim 1-16 and 18-35 are pending in the application and are presented for examination below.

Priority

2. Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) is acknowledged. This application claims the priority of U.S. Provisional Application No. 60/441,147, filed on 01/21/2003.

Drawings

3. The drawings were received on 10/13/2006. These drawings are acceptable.

Claim Interpretations

4. In claim 1 for example, Applicant recites the term "time-scaling the collected data to make the collected data a linear function of time". This term is not necessarily interpreted to mean that the input parameter to the DOE semiconductor tool system is time. For example, in a chemical-mechanical planarization (CMP) tool, where the output parameter of interest is thickness, there are several input parameters of interest that can have an effect on the output thickness, such as pressure and temperature. Granted, time is also an input parameter of interest that can have an effect on the output thickness. However, this is not how the term "make the collected data a linear function of time" is being interpreted. Furthermore, the Office does not think that the Applicant intends for the term to mean this anyway. Granted, it is possible that one of the input parameters to the DOE system *could* be time, but it is not required by claim 1.

Rather, this term is interpreted by the Office to mean scaling collected data (output data) in order make non-linear collected data appear as a linear function in a particular segment of time. This interpretation is consistent with the Applicant's arguments and the supporting reference filed on 4/27/06 The term does not necessarily have anything to do with "time" being an input to the DOE semiconductor tool system, i.e., the CMP tool.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-4, 6-13, 16, 19-26, and 28-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goldman et al. US 2002/0128805 in view of Tan, L., Cameron, D., and C. McCorkell. "Steady-State Regression Analysis and Optimization of Multivariable Plasma Etching System". IEEE (1994): 1986-1991.

Goldman et al. discloses:

1. A method of automation performed on a semiconductor manufacturing tool, comprising the acts of:

(a) automatically running a set of designed experiments on the tool (e.g., [0082]-[0083]: "The process is preferably carried out for each one of the recommended experiments", Fig. 1: "Carry out experiments");

(b) collecting data resulting from running the experiments (e.g., [0082]-[0083]: "The results are preferably provided as a table, each row representing a different experiment");

~~(c) wherein the collected data is not a linear function of time, time-scaling the collected data to make the collected data a linear function of time;~~

(d) creating a model based on the ~~time-scaled~~ collected data (e.g., [0084]-[0089]: "In Fig. 5, a mathematical stage of regression is carried out to calculate a formula that describes the process output in terms of the inputs. More precisely, regression involves the taking of the formula of the model type selected previously and deriving coefficients for each of the terms so as best to fit the input data with the observed outputs.", Fig. 5: "Regression to Build Formula"); and

(e) using the model to control the tool (e.g., [0090]-[0091], Fig. 5: "Control Process Using Lookup Table").

2. **The method of claim 1, wherein act (b) is performed automatically** (e.g., [0082]-[0083]: "The results are preferably provided as a table, each row representing a different experiment", Examiner Note (EN): *Although the results may be input to the table manually, they are still collected or obtained "automatically" by the semiconductor tool.*).

3. **The method of claim 1, wherein act (d) is performed automatically** (e.g., [0084]-[0089], EN: *This claim is being interpreted as being directed to act "(d)", as opposed to act "(c)". See Claim Objections above.*).

4. **The method of claim 1, further including automatically creating the set of designed experiments for the tool** (e.g., Fig. 1: "Calculate no. of experiments", [0071]-[0082]: "The recommended number [of experiments] is calculated using predetermined rules based on the selected model type and the number of inputs"..."The system now recommends input values to be used for each of the recommended experiments").

6. **The method of claim 1, further including at least one of: importing data collected by running at least one experiment on an external system; and importing data collected during at least one previously run experiment** (e.g., [0017]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model", EN: *The "newly obtained empirical data" of Goldman et al. correlates to the claimed "data collected during at least one previously run experiment", i.e., the "imported data".*, [0119]: "In a further embodiment instead of beginning the DOE process again, a previously obtained DOE formula is reverted to.", EN: *The "previously obtained DOE formula" of Goldman et al. can also be considered to generally correlate to the claimed "data collected during at least one previously run experiment".*).

7. **The method of claim 6, further including: automatically creating a model based on the imported data and user input** (e.g., [0117]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model, for example, when obtaining information, it is possible to enter the data directly into the current lookup table. Alternatively it is possible to wait until a statistically significant sample has been obtained before altering the look up table", [0120]: "Thus the maximum user intervention that is necessary is preferably arranging the settings for the DOE defined experiments",

EN: *The "altered lookup table" of Goldman et al. corresponds to the claimed "creating a model based on the imported data".*).

8. **The method of claim 6, further including: automatically creating a model based on the ~~time-sealed~~ collected data, the imported data and user input** (e.g., [0117]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model, for example, when obtaining information, it is possible to enter the data directly into the current lookup table. Alternatively it is possible to wait until a statistically significant sample has been obtained before altering the look up table", [0120]: "Thus the maximum user intervention that is necessary is preferably arranging the settings for the DOE defined experiments", EN: *The data contained in the "current lookup table" of Goldman et al. corresponds to the claimed "collected data".*).

9. **The method of claim 1, further including: allowing a user to interactively select one or more parameters to be adjusted between the experiments of the designed set of experiments and select one or more set of data to be collected** (e.g., Fig. 1: "Define process step (input, output)", "Define range for each input, output", "Define model type linear/quadratic with/without interactions", [0071]-[0082]).

10. **The method of claim 9, further including: automatically generating the design set of experiments** (e.g., Fig. 1: "Calculate no. of experiments", [0071]-[0082]: "The recommended number [of experiments] is calculated using predetermined rules based on the selected model type and the number of inputs"..."The system now recommends input values to be used for each of the recommended experiments") **based on the user selected parameters and set of data to be collected** (e.g., Fig. 1: "Define process step (input, output)", "Define range for each input, output", "Define model type linear/quadratic with/without interactions", [0071]-[0082]).

11. **The method of claim 1, further including: collecting the data based on a wafer-by-wafer basis** (e.g., [0092]-[0099]);

12. **A method of automation performed on a tool to manufacture devices, comprising the acts of:**

(a) automatically creating a set of designed experiments (e.g., Fig. 1: "Calculate no. of experiments", [0071]-[0082]: "The recommended number [of experiments] is calculated using predetermined rules based on the

selected model type and the number of inputs"..."The system now recommends input values to be used for each of the recommended experiments");

(b) automatically running the set of designed experiments on the tool (e.g., [0082]-[0083]: "The process is preferably carried out for each one of the recommended experiments", Fig. 1: "Carry out experiments");

(c) automatically collecting data resulting from running the experiments (e.g., [0082]-[0083]: "The results are preferably provided as a table, each row representing a different experiment"), **wherein the data are collected on a wafer-by-wafer basis** (e.g., [0092]-[0099]);

~~**(d) where the collected data is not a linear function of time, time-scaling the collected data to make the collected data a linear function of time;**~~

(e) automatically creating a model based on the ~~time-scaled~~ collected data (e.g., [0084]-[0089]: "In Fig. 5, a mathematical stage of regression is carried out to calculate a formula that describes the process output in terms of the inputs. More precisely, regression involves the taking of the formula of the model type selected previously and deriving coefficients for each of the terms so as best to fit the input data with the observed outputs.", Fig. 5: "Regression to Build Formula"); **and**

(f) using the model to control the tool (e.g., [0090]-[0091], Fig. 5: "Control Process Using Lookup Table").

13. A method of automation performed on a tool to manufacture devices, comprising the acts of:

(a) automatically running a set of designed experiments on the tool (e.g., [0082]-[0083]: "The process is preferably carried out for each one of the recommended experiments", Fig. 1: "Carry out experiments");

(b) automatically collecting data resulting from running the experiments (e.g., [0082]-[0083]: "The results are preferably provided as a table, each row representing a different experiment");

~~**(c) where the collected data is not a linear function of time, time-scaling the collected data to make the collected data a linear function of time;**~~

(d) creating a model based on the ~~time-scaled~~ collected data (e.g., [0084]-[0089]: "In Fig. 5, a mathematical stage of regression is carried out to calculate a formula that describes the process output in terms of the inputs. More precisely, regression involves the taking of the formula of the model type selected previously and deriving coefficients for each of the terms so as best to fit the input data with the observed outputs.", Fig. 5:

"Regression to Build Formula") **and imported data** (e.g., [0117]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model, for example, when obtaining information, it is possible to enter the data directly into the current lookup table. Alternatively it is possible to wait until a statistically significant sample has been obtained before altering the look up table", [0120]: "Thus the maximum user intervention that is necessary is preferably arranging the settings for the DOE defined experiments", EN: *The "altered lookup table" of Goldman et al. corresponds to the claimed "creating a model based on the imported data".*); **and**

(e) using the model to control the tool (e.g., [0090]-[0091], Fig. 5: "Control Process Using Lookup Table").

16. A computer-implemented system of automating a semiconductor manufacturing tool, comprising:

(a) a computer (e.g., [0090]-[0091]);

(b) a DOE system configured to automatically create a designed set of experiments for the tool (e.g., Fig. 1: "Calculate no. of experiments", [0071]-[0082]: "The recommended number [of experiments] is calculated using predetermined rules based on the selected model type and the number of inputs"..."The system now recommends input values to be used for each of the recommended experiments");

(c) a controller configured to automatically run the created set of experiments on the tool and collect data resulting from running the experiments (e.g., [0082]-[0083]: "The process is preferably carried out for each one of the recommended experiments", Fig. 1: "Carry out experiments"); **and**

(d) a modeling environment configured to create a model based on the ~~time-sealed~~ collected data (e.g., [0084]-[0089]: "In Fig. 5, a mathematical stage of regression is carried out to calculate a formula that describes the process output in terms of the inputs. More precisely, regression involves the taking of the formula of the model type selected previously and deriving coefficients for each of the terms so as best to fit the input data with the observed outputs.", Fig. 5: "Regression to Build Formula"), **wherein the controller is further configured to control the tool based on the created model** (e.g., [0090]-[0091], Fig. 5: "Control Process Using Lookup Table"), **and wherein the DOE system, controller and modeling environment are integrated with each other** (e.g., [0071]-[0099]),

~~**wherein the DOE system is further configured to time scale the collected data to make the collected data a linear function of time if the collected data is not a linear function of time.**~~

18. The system of claim 16, wherein the DOE system is further configured to create automatically the set of designed experiments for the tool (e.g., Fig. 1, [0071]-[0082]: "The recommended number [of experiments] is calculated using predetermined rules based on the selected model type and the number of inputs"..."The system now recommends input values to be used for each of the recommended experiments").

19. The system of claim 16, wherein the DOE system is further configured to import at least one of data collected by running at least one experiment on an external system and data collected during at least one previously run experiment (e.g., [0017]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model", EN: *The "newly obtained empirical data" of Goldman et al. correlates to the claimed "data collected during at least one previously run experiment", i.e., the "imported data".*, [0119]: "In a further embodiment instead of beginning the DOE process again, a previously obtained DOE formula is reverted to.").

20. The system of claim 19, wherein the DOE system is further configured to create a model based on the imported data and user input (e.g., [0117]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model, for example, when obtaining information, it is possible to enter the data directly into the current lookup table. Alternatively it is possible to wait until a statistically significant sample has been obtained before altering the look up table", [0120]: "Thus the maximum user intervention that is necessary is preferably arranging the settings for the DOE defined experiments", EN: *The "altered lookup table" of Goldman et al. corresponds to the claimed "creating a model based on the imported data".*).

21. The system of claim 19, wherein the DOE system is further configured to create a model based on the ~~sealed~~ collected data, the imported data, and user input (e.g., [0117]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model, for example, when obtaining information, it is possible to enter the data directly into the current lookup table. Alternatively it is possible to wait until a statistically significant sample has been obtained before altering the look up table", [0120]: "Thus the maximum user intervention that is necessary is preferably arranging the settings for the

DOE defined experiments", EN: *The data contained in the "current lookup table" of Goldman et al. corresponds to the claimed "collected data".*).

22. **The system of claim 16, wherein the DOE system is further configured to allow a user to interactively select one or more parameters to be adjusted between the experiments of the designed set of experiments and select one or more set of data to be collected** (e.g., Fig. 1: "Define process step (input, output)", "Define range for each input, output", "Define model type linear/quadratic with/without interactions", [0071]-[0082]).

23. **The system of claim 22, wherein the DOE system is furthered configured to generate automatically the design set of experiments** (e.g., Fig. 1: "Calculate no. of experiments", [0071]-[0082]: "The recommended number [of experiments] is calculated using predetermined rules based on the selected model type and the number of inputs"…"The system now recommends input values to be used for each of the recommended experiments") **based on the user selected parameters and set of data to be collected** (e.g., Fig. 1: "Define process step (input, output)", "Define range for each input, output", "Define model type linear/quadratic with/without interactions", [0071]-[0082]).

24. **The system of claim 16, wherein the controller is further configured to collect the data on a wafer-by-wafer basis** (e.g., [0092]-[0099]).

25. **A computer readable medium for storing instructions being executed by one or more computers, the instructions directing the one or more computers for automatically generating design of experiment (DOE), the instructions comprising implementation of the acts of:**

(a) automatically running a set of designed experiments on the tool (e.g., [0082]-[0083]: "The process is preferably carried out for each one of the recommended experiments", Fig. 1: "Carry out experiments");

(b) automatically collecting data resulting from running the experiments (e.g., [0082]-[0083]: "The results are preferably provided as a table, each row representing a different experiment");

~~**(c) where the collected data is not a linear function of time, time scaling the collected data to make the collected data a linear function of time;**~~

(d) creating a model based on the scaled collected data (e.g., [0084]-[0089]: "In Fig. 5, a mathematical stage of regression is carried out to calculate a formula that describes the process output in terms of the inputs.

More precisely, regression involves the taking of the formula of the model type selected previously and deriving coefficients for each of the terms so as best to fit the input data with the observed outputs.", Fig. 5: "Regression to Build Formula"); **and**

(e) using the model to control the tool (e.g., [0090]-[0091], Fig. 5: "Control Process Using Lookup Table").

26. The medium of claim 25, further including the instructions for implementing the act of: automatically creating the set of designed experiments for the tool (e.g., Fig. 1: "Calculate no. of experiments", [0071]-[0082]: "The recommended number [of experiments] is calculated using predetermined rules based on the selected model type and the number of inputs"..."The system now recommends input values to be used for each of the recommended experiments").

28. The medium of claim 25, further including the instructions for implementing at least one act of: importing data collected by running at least one experiment on an external system; and importing data collected during at least one previously run experiment (e.g., [0017]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model", EN: *The "newly obtained empirical data" of Goldman et al. correlates to the claimed "data collected during at least one previously run experiment", i.e., the "imported data".*, [0119]: "In a further embodiment instead of beginning the DOE process again, a previously obtained DOE formula is reverted to.").

29. The medium of claim 28, further comprising the instructions for implementing the act of: automatically creating a model based on the imported data and user input (e.g., [0117]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model, for example, when obtaining information, it is possible to enter the data directly into the current lookup table. Alternatively it is possible to wait until a statistically significant sample has been obtained before altering the look up table", [0120]: "Thus the maximum user intervention that is necessary is preferably arranging the settings for the DOE defined experiments", EN: *The "altered lookup table" of Goldman et al. corresponds to the claimed "creating a model based on the imported data".*).

30. The medium of claim 28, further including the instructions for implementing the act of: automatically creating a model based on user input, the ~~time-sealed~~ collected data and the imported data

(e.g., [0117]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model, for example, when obtaining information, it is possible to enter the data directly into the current lookup table. Alternatively it is possible to wait until a statistically significant sample has been obtained before altering the look up table", [0120]: "Thus the maximum user intervention that is necessary is preferably arranging the settings for the DOE defined experiments", EN: *The data contained in the "current lookup table" of Goldman et al. corresponds to the claimed "collected data".*).

31. The medium of claim 25, further including the instructions for implementing the act of allowing a user to interactively select one or more parameters to be adjusted between the experiments of the designed set of experiments and select one or more set of data to be collected (e.g., Fig. 1: "Define process step (input, output)", "Define range for each input, output", "Define model type linear/quadratic with/without interactions", [0071]-[0082]).

32. The medium of claim 31, further including the instructions for implementing the act of: automatically generating the design set of experiments (e.g., Fig. 1: "Calculate no. of experiments", [0071]-[0082]: "The recommended number [of experiments] is calculated using predetermined rules based on the selected model type and the number of inputs"..."The system now recommends input values to be used for each of the recommended experiments") **based on the user selected parameters and set of data to be collected** (e.g., Fig. 1: "Define process step (input, output)", "Define range for each input, output", "Define model type linear/quadratic with/without interactions", [0071]-[0082]).

33. The medium of claim 25, further including the instructions for implementing the act of: collecting the data based on a wafer-by-wafer basis (e.g., [0092]-[0099]).

34. The method of claim 1, wherein the tool is a Chemical-Mechanical-Planarization tool (e.g., [0092]-[0099]: "In the process, a silicon wafer is sharpened, that is to say an outer layer perhaps an oxide layer, is removed", EN: *The wafer sharpening process of Goldman et al. in which an outer layer is removed is considered analogous to a chemical-mechanical planarization process.*).

Regarding independent claims 1, 12, 13, 16, and 25, Goldman et al. discloses that a mathematical stage of regression is carried out in order to calculate a formula that describes the process output in terms of the inputs. The regression involves the taking of the formula of the model type selected previously and deriving coefficients for each of the terms so as best to fit the input data with the observed outputs (e.g., [0085]).

Goldman et al. is generally silent as to exactly how the coefficients are actually derived, except to say that they are derived using the selected model type, along with the input data and observed outputs, i.e., Goldman et al. does not divulge the specific mathematical steps associated with the derivation of the coefficients.

However, it is well known in the art to linearize data when creating a model of the data. The linearization is generally accomplished by "time-scaling" the data, which is also well known in the art. Linearization is the process of finding a linear model that approximates a nonlinear model. When magnitudes of variables in nonlinear models are different, it is routine to scale the variables so that all variables have similar magnitudes. Time scaling includes similar scaling of collected data to make the data a linear function of time. Such scaling of variables results in numerical values that falls within a narrow-enough range of magnitude to minimize errors and allow for ease of computation. One type of time scaling is where units of time are changed to ease the computation strain when a dynamic system is either extremely fast or extremely slow.

The Tan et al. reference provides an explicit teaching of these well known features.

Tan et al. discloses a steady-state regression analysis and optimization of a multivariable plasma etching system using design of experiments (DOE), comprising scaling a DOE-derived model so that both inputs and outputs are on the same scale. The resulting equations are scaled to lie in the specific range (i.e., -2 to 2), for both inputs and outputs. Tan et al. discloses that this scaling is necessary for proper application of certain control strategies, which are known to be scale-dependent. For example, when the initial regression equations are non-linear, scaling is necessary in order to linearize the equations so that the steady state gains can be determined (e.g., pg. 1988, col. 2).

Goldman et al. and Tan et al. are analagous art since both pertain to methods for performing automation on semiconductor manufacturing tools using design of experiment (DOE) techniques.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the teachings of Tan et al. when deriving the model coefficients of Goldman et al. since Tan et al. teaches that it is desirable to scale the inputs and outputs of a model in order to linearize the model so that the steady state gains of the model can be determined. The determination of the steady state gains is a scale-dependent control strategy (e.g., pg. 1988, col. 2). The steady state gains are ultimately used to determine the coefficients of a model (e.g., pg. 1988).

7. Claims 5, 14, 15, 18, 27, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goldman et al. in view of Tan et al. as applied to claims 1, 13, 16, and 25 above, and further in view of Daft et al. US 2003/0154062.

Goldman et al. in view of Tan et al. discloses:

importing data from previously run experiments and importing one or more designed experiments (e.g., see Goldman et al. @ [0017]: "Furthermore, there are numerous methods, in addition to those already described, for incorporating newly obtained empirical data into the model", EN: *The "newly obtained empirical data" of Goldman et al. correlates to the claimed "data from previously run experiments", i.e., the "imported data".*, [0119]: "In a further embodiment instead of beginning the DOE process again, a previously obtained DOE formula is reverted to.", EN: *The "previously obtained DOE formula" of Goldman et al. can also be considered to generally correlate to the claimed "data from previously run experiments", and to the claimed "importing one or more designed experiments". The "formula" of Goldman et al. is essentially the "designed experiment".*);

wherein the tool is a Chemical-Mechanical-Planarization tool (e.g., see Goldman et al. @ [0092]-[0099]: "In the process, a silicon wafer is sharpened, that is to say an outer layer perhaps an oxide layer, is removed", EN: *The wafer sharpening process of Goldman et al. in which an outer layer is removed is considered analogous to a chemical-mechanical planarization process.*).

Goldman et al. in view of Tan et al. does not appear to explicity disclose that the designed experiment is imported from an "external system".

However, Daft et al. discloses a system and method for statistical design of an ultrasound probe and imager system, and an associated graphical user interface for selecting input parameters to be used in an ultrasound simulation. The system comprises a DOE controller that can automatically import the DOE data and generate

transfer functions from the simulation-based data (e.g., [0046]: "DOE controller can automatically import the DOE data").

Daft et al. is analagous to Goldman et al. and Tan et al. since it is also directed to a method for developing a system model or tranfer function from a set of designed experiments.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Goldman et al. in view of Tan et al. with Daft et al. in order to make the system of Goldman et al. in view of Tan et al. more versatile by allowing the system of Goldman et al. in view of Tan et al. to import experimental data generated by a separate, non-integrated system, as taught by Daft.

It would have additionally been obvious since Goldman et al. teaches (e.g., [0008]-[0011]) that a user of a semiconductor tool (i.e., semiconductor device manufacturer) may find it desirable to import or use a designed experiment from the tool manufacturer in order to allow for operation of the tool before a statistically significant data set can be obtained. Although Goldman et al. teaches that such a scenario is rare, since tool manufacturers are not generally willing to provide data sets to their competitors and since tool manufacturers generally do not carry out the process and thus do not have their own independent data sets to sell along with the tool, Goldman et al. nevertheless discloses that such a scenario is plausible.

Furthermore, there are several other situations in which a device manufacturer may wish to import data from an external, third party-software system. Such third-party DOE software systems were well known in the art at the time of Applicant's invention

(e.g., see [0043] of the instant Application). Such a setup would allow for remote off-site developers to create designed experiments and export them to the semiconductor device manufacturing facility.

Response to Arguments

8. Applicant's arguments, see pages 11-14, filed 10/13/2006, with respect to specification objections, drawing objections, claim objections, 35 U.S.C. 112 2nd paragraph rejections, and 35 U.S.C. 101 rejections have been fully considered and are persuasive. These objections and rejections have been withdrawn in light of the various amendments made.

9. Applicant's arguments filed 10/13/2006, see pages 12-14, regarding the rejection of claim 1-4, 6-13, 16, 19-26, and 28-34 under 35 U.S.C. 103(a) as being obvious of Goldman et al. in view of Tan have been fully considered but they are not persuasive.

Applicant's concerns and arguments, see page 12 line 22 – page 13 line 14, regarding the claim interpretation of the term "time-scaling the collected data to make the collected data a linear function of time" have been addressed in the Claim Interpretation section above. This term is interpreted by the Office to mean scaling collected data (output data) in order make non-linear collected data appear as a linear function in a particular segment of time, as desired by the Applicant. This interpretation is not materially different than the last interpretation posed by the Office, with the execption of the fact that "time-invariant" is now not being read into the claims. Goldman et al. in view of Tan still teaches the claimed feature.

Applicant argues, see page 13 line 15 – page 14 line 2, that "Tan neither teaches nor suggests the use of a time-scaling feature to collected data". However, Tan et al. discloses a steady-state regression analysis and optimization of a multivariable plasma

etching system using design of experiments (DOE), comprising scaling a DOE-derived model so that both inputs and outputs are on the same scale. The resulting equations are scaled to lie in the specific range (i.e., -2 to 2), for both inputs and outputs. Tan et al. discloses that this scaling is necessary for proper application of certain control strategies, which are known to be scale-dependent. For example, when the initial regression equations are non-linear, scaling is necessary in order to linearize the equations so that the steady state gains can be determined (e.g., pg. 1988, col. 2). Thus, Tan et al. provides a teaching of the fetaure that is missing from Goldman et al.

10. Applicant's arguments filed 10/13/2006, see pages 14-15, regarding the rejection of claims 5, 14, 15, 18, 27, and 35 under 35 U.S.C. 103(a) as being obvious of Goldman et al. in view of Tan and further in view of Daft et al. have been fully considered but they are not persuasive.

Applicant arguments, see page 14 line 10 – page 15 line 3, regarding Daft et al. are not persuasive. Daft et al. disclose that the "DOE controller can automatically import the DOE data" (e.g., [0046].

[Prior Arguments]

In the arguments filed 04/27/2006, see pages 8-10, Applicant made it clear that the "data regression" disclosed in Goldman et al. cannot be construed as inherently containing a "time-scaling" step. "Data regression" is defined as functional relationship

between two or more correlated variables that is often empirically determined from data and is used especially to predict values of one variable when given values of the others.

Applicant explained in the response filed 04/27/2006 that "time-scaling" data in order to "linearize" the data refers to the following:

Linearization is the process of finding a linear model that approximates a nonlinear model. When magnitudes of variables in nonlinear models are different, it is routine to scale the variables so that all variables have similar magnitudes. In the present invention, time scaling includes similar scaling of collected data to make the collected data a linear function of time. Such scaling of variables results in numerical values that falls within a narrow-enough range of magnitude to minimize errors and allow for ease of computation. One type of time scaling is where units of time are changed to ease the computation strain when a dynamic system is either extremely fast or extremely slow.

Thus, "time-scaling" data in order to "linearize" the data can be considered a more specific form of data regression, i.e., "time scaling" data in order to "linearize" the data can be considered one of the component steps of a data regression methodology, albeit not necessarily an inherent step. While Goldman et al. discloses a "data regression", the reference is silent as to whether any "time-scaling" or "linearization" takes place during the "data regression".

Tan et al. discloses a steady-state regression analysis and optimization of a multivariable plasma etching system using design of experiments (DOE), comprising scaling a DOE-derived model so that both inputs and outputs are on the same scale.

The resulting equations are scaled to lie in the specific range (i.e., -2 to 2), for both inputs and outputs. Tan et al. discloses that this scaling is necessary for proper application of certain control strategies, which are known to be scale-dependent. For example, when the initial regression equations are non-linear, scaling is necessary in order to linearize the equations so that the steady state gains can be determined (e.g., pg. 1988, col. 2). Thus, Tan et al. provides a teaching of the fetaure that is missing from Goldman et al.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ryan A. Jarrett whose telephone number is (571) 272-3742. The examiner can normally be reached on 10:00-6:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached on (571) 272-3749. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Ryan A. Jarrett
Examiner
Art Unit 2125

11/14/06
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